REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01-06-1959	Administrative Report; Open File Report	1952-1957

4. TITLE AND SUBTITLE

Termination of Assignment Report. Appendix 2.
Surface water investigations in Afghanistan: a summary of activities from 1952 to 1969

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Heckmiller, I.A.

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

US Geological Survey (USGS)
12201 Sunrise Valley Drive
Reston, VA 20192, USA

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

HVA; ICA; USGS; USAID

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Unclassified/Unlimited

13. SUPPLEMENTARY NOTES

Appendix 2.

14. ABSTRACT

The purpose of this report is to summarize briefly the history of the Surface Water Research project since its inception in 1952, the work accomplished, and the problems encountered. In general, each topic is discussed under two periods of time: 1952-1963, when projects were confined to the Helmand River Valley and was entitled "Helmand Surface Water Investigations (306-12-021, 306-M-12-AD and 306-AC-12-AD5)," and 1963-1969 when activities were expanded to cover most of Afghanistan and title was changed to "Surface Water Research (306-11-190-002)".

Prepared by the United States Geological Survey in cooperation with the Water and Soil Survey Department, Ministry of Agriculture and Irrigation, Royal Government of Afghanistan under the auspices of the United States Agency for International Development. 18 appendices.

15. SUBJECT TERMS

Afghanistan. Drainage. Flood control. Helmand River Project. HVA. Helmand Valley Authority. Hydrology. Hydropower. Irrigation. International Cooperation Administration. Lashkar Gah. Rainfall Runoff Calculations. Stream-flow Data. Stream gaging stations. Stream measurements. Surface Water. Water supply.

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER *(Include area code)*
U	U	U	UU	27	

(200)
WR3a,sw
appendix 2

Heckmiller 1959 Interior

Appendix (2)

UNITED STATES OPERATIONS MISSION
TO AFGHANISTAN
INTERNATIONAL COOPERATION ADMINISTRATION
LASHKAR GAH, AFGHANISTAN

U.S. GEOLOGICAL SURVEY
RESTON, VA.
SEP 5 1980
LIBRARY

TERMINATION OF ASSIGNMENT REPORT

by

I. A. Heckmiller
Hydrologist
USGS-ICA, USOM/Afghanistan

June 1959

TERMINAL REPORT

I. A. HECKMILLER
Hydrologist
USGS-ICA, USOM/Afghanistan

GENERAL

The history, purpose and the work covered by the Helmand Valley Surface-Water Investigation Project in cooperation with the Helmand Valley Authority from its beginning under Morrison-Knudsen-Afghanistan, Incorporated and its inception as a Foreign Aid Project in 1952, under Point IV, and later, successively known as Technical Cooperation Administration (TCA); Foreign Operations Administration (FOA), and International Cooperation Administration (ICA) through 1958, will not be covered in this report. For this information you are referred to Mr. Leonard J. Snell's terminal report of January 1957. Mr. Snell, my predecessor (1952-54) and colleague (1954-56), has so thoroughly and ably covered the above that the writer deems it unnecessary to further elaborate nor repeat, but will cover the progress of this project from January 1957, to date.

The writer....

The writer arrived in Afghanistan June 1954, to assist Mr. Snell with the Helmand Valley Surface-Water Investigation Project, with headquarters at Girdshk, while Mr. Snell was to undertake the review of past data that all available records could be consolidated into a pamphlet publication. January or February 1955, the headquarters and living facilities were moved to the Morrison-Knudsen-Afghanistan's vacated facilities at Chah-i-Anjir for temporary occupancy until the permanent quarters at Lashkar Gah (formerly Lashkari Bazaar) were to become available. In September of that year some housing accommodations at Lashkar Gah were made available. The office was again setup, temporarily, in a vacant residence at Lashkar Gah. In March 1958, the office was moved to quarters in the newly completed Afghan Bank building, where it is to remain until the Helmand Valley Authority Administration building is completed.

PROGRAM

Description and Objectives of the Project (from project agreement):

"The primary objective in the hydrologic program is the surface-water investigation to obtain data that will permit a sound determination of the hydrologic regimen of the Helmand River system; the secondary, long-term objective, is to prepare Afghan personnel to carry on the investigation so as to assume ultimate responsibility. Specifically the services consist of assisting the Helmand Valley Authority to:

a. Supervise and operate existing network of stream-gaging stations.

b. Establish and operate additional stream-flow stations; rate canals and other miscellaneous channels as required for canal operation.

c. Review, compile, and analyze stream-flow records for current and future technical use.

d. Establish climatological stations as required in the Helmand Valley.

e. Study rainfall-runoff correlations, canal losses, etc., forecasts; make analysis and corrective or supplemental recommendations.

f. Train Afghan personnel in both field and office functions.

g. Furnish advisory service to the HVA.

h. Aid in the development of an Afghan organization for the collection and analysis of hydrologic data and reports; ultimately, to work on a national scale.

The objectives...

The objectives, as stated, and the physical data form a necessary component in the overall Afghan program of developing and implementing a practical program of land and water utilization for agricultural and industrial development of the country and the Helmand Valley watershed in particular. Surface-water control and utilization will aid measurably in planning means of increased agricultural production and industrial development by means of electrical power."

1) The following stream-flow stations have been operated in the Helmand Valley:

Helmand River near Dehraoud	(R)	Oct. 1952-
Tirin River at Dehraout	(R)	Mar. 1952-
Kajakai Reservoir	(R)	Jan. 1953-
Helmand River below Kajaki dam	(R)	Oct. 1946-
Musa Qala River at Musa Qala	(N)	Apr. 1952-
Seraj Canal at Sangin	(N)	Oct. 1952-
Boghra Canal near Girdeh Diversion dam	(N)	Oct. 1954-
Arghandab River above Arghandab Reservoir	(R)	Oct. 1951-
Arghandab Reservoir	(R)	Feb. 1952-
Arghandab River below Arghandab dam	(R)	Oct. 1947-
Arghastan River near Kandahar	(R)	Oct. 1952- Sept. 1953; Oct. 1954-
Arghandab River near Kala Bist	(R)	Oct. 1947-
Helmand River at Darweshan	(R)	Oct. 1950-
Helmand River near Chahar Burjak	(R)	Oct. 1946-
Khash Rud at Dilaram	(R)	Oct. 1952-
Farah River near Farah	(R)	Apr. 1955-

Note: Stations are listed in downstream order and indentations indicate intervening tributaries.

(R) - designates automatic recording station
(N) - designates non-recording station

2) The operation....

2) The operation of the network of stream-gaging stations, as in any area, included the maintenance of all equipment needed in this connection. Flood damage to recorder shelters and cableway structures were rather extensive over the past three years. In some cases the floods or high flows have shifted the channel completely necessitating the reinstallation at another site. Construction in this connection was carried on at the following stations:

a. Helmand River near Dahraout, reinstallation of the cableway, completed September 1958.

b. Khash Rud near Dilaram, reinstallation of the cableway, completed December 1957.

c. Khash Rud at Dilaram, relocation of the recorder stilling-well and shelter to a site 2 miles upstream, completed July 1958.

d. Helmand River near Chaker Darjak, rehabilation of the recorder stilling-well and shelter to obtain high-stage records and for flood protection to the recorder, completed November 1958.

e. Arghandab River above Arghandab Reservoir, relocation of the recorder stilling-well and shelter to a site 700 feet upstream, completed September 1958.

f. Tirin River at Dahraout, relocation of the recorder stilling-well and shelter to site on the opposite side of valley as river channel had shifted, completed October 1957.

g. Arghandab ...

g. Arghandab River above Arghandab Reservoir, reinstallation of a cableway is needed and is planned to be undertaken as soon as the flow diminishes this summer.

5) Improvements to existing or new stations were as follows:

a. Erected 1000' cableway over the Helmand River at Darweshan, completed June 1957.

b. Erected water-stage recorder stilling well and shelter on bridge over Farah River near Farah to replace the poor non-recording station previously operated, completed July 1956.

c. Installed new aluminum sit-down type cableseat on cableways at the following stations:

Helmand River below Kajakai dam	Feb, 1957
Helmand River at Darweshan	June 1957
Helmand River near Dehraoud	Sept, 1956
Helmand River near Chahar Burjak	Mar, 1957
Arghandab River below Arghandab dam	May 1956
Arghandab River near Kala Bist	Apr, 1956

4) Canals and turnout ratings were furnished for the Boghra, Shamalan, Darweshan, Tarnak and South canals as well as discharge measurements of various irrigation ditches where the information may be of value at a later date. This information is made available principally for the Canal Operation and Maintenance section of Helmand Valley Authority and is available to other agencies needing this information.

5) All records ...

5) All records through September 1958 have been analyzed, computed and compiled for forwarding to the United States Geological Survey, Section of Reports, Washington, D. C., where they are reviewed and edited for theory, continuity and accuracy as is done with all United States Geological Survey data published in the "Water Supply Papers". When publication facilities are available to Helmand Valley Authority the reviewed records will be ready for duplication in a similar pamphlet, as was prepared by the United States Geological Survey in Washington, of the 1947-54 records, for sample purposes. The end result of the compiled data is an annual record of mean daily gage height and discharge; monthly and yearly totals for calendar and water-year, in second-feet and acre-feet; and mean daily and instantaneous maximum and minimum discharges for each station. In preparation of these records analysis, stage-discharge relation curves and tables, hydrograph and description for each station are prepared.

6) Current computations of the Kajakai and Arghandab reservoirs have been made available on a monthly basis. These consist of the following:

a. 12 P.M., reservoir ..

a. 12 P.M., reservoir elevations and reservoir contents from which the daily reservoir change in contents is computed.

b. The mean daily release through the valves as well as spillway flow when it was spilling, in second-feet and acre-feet.

c. The mean daily reservoir evaporation as computed from evaporation-pan readings obtained at Kajaki or Lashkar Gah, whichever happened to be available.

d. The mean daily inflow, usually, computed from data collected at stations located above reservoir.

e. Valve openings percentages throughout the month.

Reservoir operation records have been furnished all Helmand Valley Authority offices dealing with information as well Morrison-Knudsen-Afghanistan and Afghan Construction Unit.

7) Monthly hydrological summaries have been prepared and are made available to International Cooperation Administration, Kabul and Lashkar Gah technicians, Helmand Valley Authority offices, Morrison-Knudsen and Afghan Construction Unit. They carry comments on weather conditions; maximum and minimum temperatures; monthly mean maximum and minimum temperatures; precipitations; evaporations; mean maximum and minimum humidities; and average wind velocities. Comments on stream-flow and runoff expectancy with a summary of

reservoir operation ....

reservoir operation data with the addition of the percentage of spillway level capacity of the reservoirs at the month's end.

8) Climatological stations were established at the following locations in the past with the hope of collecting information on temperatures, precipitation, evaporation and wind:

a. Lashkar Gah
b. Kala Kong
c. Panjao
d. Nad-i-Ali
e. Mukur
f. Orosagon
g. Dehraout

The first two have been in continuous operation and have furnished reliable data while the remaining stations, excepting Panjao, were abandoned because of either incompetent, incapable or unreliable observers. The station at Panjao was established five years ago with the hope of, mainly, obtaining information on temperatures, precipitation and snow cover for working up a snow-melt runoff correlation with the results of the snow surveys conducted each winter in the vicinity of Mukur and Ghazni. The results of these surveys are far from that desired, but in as much as no equipment can be made available for travel into the inundated areas of the Helmand water shed for this information the next best was relied upon.

The data of the climatological stations is furnished to the Afghan Meterological Service and is available to other agencies seeking it.

9) It has always been the policy of this office to work very closely with the Engineering Department and the Canal Operation and Maintenance Section of the Helmand Valley Authority and to furnish any advisory service they have sought or may seek.

10) The most important objective of this project is the training of Afghan personnel and the development of an Afghan organization to carry on with this type of program. The achievements toward this end have been most discouraging when viewed in comparison to State-side expectancies. One should, in an underdeveloped and young country, young with respect to the time it has been exposed to modern customs, education and facilities, reduce our expectancy of achievements to something more in line with their rate of capabilities in absorption, development and expansion. Progress has been made toward this end in that the five Afghan personnel, presently in this section, have acquired knowledge in field technic and simple office computations, within the realm of their abilities. At this writing, one of the five will be lost to this section for some time as he is pre-

paring to leave....

paring to leave for military training. Two of the five are graduates of the Afghan Institute of Technology, in Kabul, one of which has just returned from 3½ years of college work at the University of Nebraska, Lincoln, Nebraska and should be a great asset in this section. With his education in college on subjects related to hydrology and in a comparatively short period of close supervision he should become capable of handling office work to a more proficient degree than can be expected of those having had only the lower level educational training.

The following is a list of Afghan personnel having had training or still receiving training in this section, with whom the writer has been associated:

Abdul KHALIQ: December 1952 to present. Worked with Morrison-Knudsen-Afghanistan engineering department prior to that date. Handles simple field work and simple office computations well.

Sher Ahmad SAHAMDAR: May 1953 to August 1955, January 1953 to January 1950. Completed 10th or 11th class. He was recommended and sent to the United States, September 1955, for educational training. Attended the University of Wyoming and the Junior College of the University of Nebraska, as well as, receive practical training

under the ....

under the United States Geological Survey district office in Lincoln, Nebraska. He was unable to handle the school work and was recalled October 1957. Dissatisfied with the authority, salary given him and with the refusal of release for other employment he refused to cooperate. After repeated personal difficulties with his associates the Helmand Valley Authority officials transferred him from this section.

Abdul Wahab JAVI: August 1955 to September 1954. One year at Roberts College, Istanbul, Turkey. Resigned to accept employment with United Nations Mission in Kabul.

Abdul Ghaffar SHUJA: October 1953 to August 1955. One year at Roberts College, Istanbul, Turkey. September 1955, he was sent to the American University of Beirut to study engineering, but was enrolled in subjects unrelated to engineering. Upon his return, in 1958, he was assigned to the Canal Operation and Maintenance Section.

Hasan Ali TAYEB: June 1954 to August 1955, April 1959 to present date. A graduate of Afghan Institute of Technology. September 1955 to June 1956, at the University of Wyoming, July 1956 to February 1959, at the University of Nebraska enrolled in civil engineering and United States Geological Survey district office, Lincoln, Nebraska, obtaining practical training. His grades in September 1958, were below the requirements

for entrance ...

for entrance but was enrolled in two minor subjects unrelated to hydrology, after which he was recalled.

Ghulam RASUL: July 1955 to May 1958. Attended Afghan Institute of Technology, resigned for military purposes, but accepted employment with Afghan Air Authority, AAA (CAA) Kandahar, at a considerably higher salary.

Asin AHMAD: July 1955 to present. Graduate of Afghan Institute of Technology. He was absent on sick leave for several months. Handles limited office work well, if closely supervised. Does a good job of lettering figures, when he so desires.

BAHAUDIN: July 1955 to present. Attended Afghan Institute of Technology. Handles limited office and field work well. Does all the office typing, but due to his poor command of English and grammar is below satisfactory.

Abdul Ghafoor ARAFI: August 1955 to August 1956. Graduate of Afghan Institute of Technology. August 1956 to present at the American University of Beirut. No report on status nor subjects pursued.

TAHIR: July 1957 to January 1958. Completed 5th class, Kandahar. Attended Helmand Valley Authority surveying class. He was requested to resign because of the disappearance of office supplies, etc.

Abdul MASRUHAH: August 1957 to present. Completed 8th class, Kandahar. Attended Helmand Valley Authority surveying class. Has developed above that expected for his schooling. Handles limited office and field work well. Has the desire to learn; asks questions when a problem is not understood, which is most unusual.

All personnel receive training in field and office procedure as well as in the taking care of the equipment and instruments used in both field and office.

PROBLEMS and SUGGESTIONS.

These two headings will be covered simultaneously since they go hand in hand. If there were no problems there would be no suggestions to offer. The problems have been many; some have solved themselves with time and others will just take more time. The most difficult problem is the training of Afghan personnel to develop to be able to do a caliber of work consistent with United States Geological Survey (USGS) standards followed in the States.

The writer feels that the Helmand Valley Authority, Hydrology Section will continue somewhat handicapped until such

time that a .....

time that a qualified and capable engineer is willing to subject himself, full time, to the routine field and office work to obtain first hand practical experience in techniques and procedures. This will be forthcoming as the number of college trained Nationals increase. We, (ICA and USGS) should not expect trainees of ninth, tenth or even twelfth class level to learn and handle work that by our federal and state agencies have, through years of experience, found and standardized as requiring graduate engineers. This American standard is most desirable and the experience the Afghan personnel have received under this program is not to be overlooked. They have come a long way and are a great asset to this organization.

The problem of instilling work pride and responsibility has been and is a difficult one. Little has been accomplished in this important field. This faculty, in all probability, is developed along with education at a college level. In the field the hydrographer is on his own and decisions on every problem confronting him must be made by him. In the office it becomes the responsibility of each employee to check

not only the ...

not only the mathematics for errors but also the theory underlying the analysis and not just follow the reasoning of the one having prepared an outline before him. Pride is a faculty that develops within one's self and can possibly be encouraged but cannot be taught.

Problems of procurements, vehicle maintenance and warehousing have been serious at times, but as time passes and personnel and facilities in these fields develop these problems will diminish.

Road travel to stream-gaging locations in remote areas is most difficult. There has been little or no progress to meet this problem nor is there much reason to expect it to be solved, in as much as, local travel in these remote areas will continue on donkey, camel or on foot for sometime. They have little or no road for vehicle roads and bridges. The writer, having been confronted with this problem throughout his tour, has fabricated a portable adjustable bridge which is hauled on trips to these remote sections to enable the crossing of irrigation ditches and drains that are encountered. A copy of the article on this piece of equipment is attached, herewith, page 21.

Facilities to .....

Facilities to enable the measuring of flow in canals above wading stage are a scarcity. This problem has been met by the use of vehicle-winch cableway that serves the purpose very well, copy of article is attached, herewith, page 23.

Absenteeism is a problem that accounts for much lost effort in field guidance and training as well as the cause for the low quantity of productive work. The writer does not suggest to solve this by changing government regulations of long standing, but to solve the low quantity of productive work by increasing the number of personnel to do a job. The allowable time off, such as, sick leave, vacation, special leave and holidays result in postponement of field trips and office computations as well as scheduled instruction.

Salaries paid Helmand Valley Authority personnel is an important problem. Salaries are based on education with little or no consideration regarding experience and capabilities of the individual. This section has experienced a large turnover in personnel which in itself does not lead to the development of an efficient organization. The turnover has been due to government agencies, both local and foreign, offering higher salaries. The suggestive remedy to this, rather than ordering personnel to remain or refusing them a release, is the organizing of a

government wage .....

government wage stabilization board representing all government ministries. It has been observed that when an individual is refused permission to resign for more pay the quality as well as the quantity of his work drops and in many cases the organization would be better off without him.

Pilferage is a continuing problem particularily with respect to gages in canals and canal turnouts. This is not a problem at the regular stream-gaging station as watchmen are employed to protect the structures and equipment. This pilferage can probably be eliminated or at least controlled through the village chief under whose jurisdiction the particular gage is located or by the employment of more watchmen. The latter would be costly to the Helmand Valley Authority, even at their pay standards, but would retain the gage for the purpose intended.

Water from the Helmand River flows into Iran and has, for many years, been a contraversal problem which will continue until figures of flow acceptable to both countries become available. There is no gaging station at the diversion nor where the river is common to both countries, where this data should be

collected. .....

collected. It has been the recommendation in past PPA's, of the writer and Mr. Snell, Hydrologist to Afghanistan from 1952 to 1955, that a joint Afghan-Iranian stream-gaging station on the Helmand River be established and operated. But before such a station is established both countries should have a workable plan and agreement on such an endeavor. Data at a station of this type could either be collected mutually or by an independent third agency with the approval of both countries.

A recommendation to Helmand Valley Authority regarding the collection of irrigation diversion flow data for the Chakansur agricultural area was made in a letter dated March 21, 1955, copied in part as follows:

> "On a recent visit to the Chakansur area the Kala Fateh canal diversion dam in the Helmand River was observed. The local residents have done a wonderful job in building this dam by hand with the local materials available to them, but it is obvious from their complaints regarding the repeated damage by changes in river discharge to the dam and canals, as well as, by high flow that the Afghan Government or Helmand Valley Authority will, undoubtedly, be requested for financial assistance in alleviating or minimizing this type of damage by stabilizing the diversion dam and controlling the canal flow.
>
> In order that a problem of this magnitude can be handled from a practical and engineering standpoint reasonably reliable data of canal flow for as long a period as possible should be at hand to

properly design ...

properly design a control system that will meet their needs as well as accomplishing an achievement the Afghan Government will be proud of. To attain this objective this office recommends that steps be taken to establish stream-flow gaging stations on all the major diversion canals. At present there is no data available of either maximum, minimum or average flow in these canals.

Installation of automatic recording type stations would be desirable, however, if competent gage readers can be located a non-recording station would suffice and should provide the needed data.

In addition to the installation of the stations access roads must also be provided to facilitate the operation of the stations."

PORTABLE BRIDGE

BECOMES ROUTINE STREAM-GAGING EQUIPMENT IN AFGHANISTAN

By: I. A. MECHMILLER, Hydrologist

In this part of the world the local inhabitants, for the most part, have not reached the "Wheel Age" and therefore do not understand, and care less, the problems one has with vehicle travel in the undeveloped or remote sections of Afghanistan. In a country, such as this, in the remote sections that is, all transportation is carried on the backs of donkeys and camels or on foot which explains the lack of roads and structures that normally accompany a road system.

In my attempt to regularly service and collect data at stream-gaging stations located in remote areas I have found that the local residents were only interested in self preservation and their foremost desire was to get water to their wheat fields regardless of the inconvenience caused to an occasional traveler in modern conveniences. Culverts and permanent type bridges were once installed but because culvert pipe is a non-existant local commodity and is more useful to them for carrying water over a ditch they have found it more practical to move the culvert pipe from the road leaving it impassable. Likewise the many permanent type bridges made from truck frames have become impassable because of no maintenance or having been moved for use as a foot bridge.

The ditches where culverts or bridges once were, had to be filled in by hand on each trip to permit passing. When the number kept increasing and much time was consumed in filling the ditches or trying to get the vehicle out after getting it stuck I thought of the idea of using a portable adjustable bridge, as shown on accompanying photographs, at each of these places. It can be transported and used as needed and adjusted to meet the various depths of the ditches encountered. The bridge will span a ditch as much as fifteen feet at the top and is adjustable in height from 5½ to 7 feet. The sheet piling wheel runners will accommodate the narrow tread of the Jeep Pickup and the wider tread of the larger vehicles. The bridge is made of 35-pound interlocking steel sheet piling for wheel runners hinged over the adjustable support. The adjustable support is made of 3" pipe with base bearing plates and a telescoping 2" pipe bolted together permitting the vertical height adjustment. It is diagonally braced with two pieces of 1" pipe bolted to the verticals. The

top horizontal ---

top horizontal member, also of pipe, locks into the vertical legs and the wheel piling wheel runners by means of pipe lugs welded to the horizontal. It is erected by first assembling the vertical support to the required height and placing it on the ditch bank slope with the base in the center of the ditch. The two main wheel runners are placed over the two lugs of the top cross member of the support. The support is then pushed into a vertical position bringing the wheel runners into their final position. The two remaining wheel runners are then attached by means of pins forming the hinge joint. The eleven pieces forming this bridge are marked with corresponding numerals welded on the corresponding ends to avoid complications in assembling.

The bridge is held in a stationary position by a number of methods each depending on conditions encountered. The following methods have been used:

1) By droping the free ends of the wheel runners below the ground surface to obtain firm and bearing.

2) By driving iron bars into the ground at the four ends of the wheel runners.

3) By attaching a winch cable from a second vehicle to the bridge support to prevent forward movement of the bridge as the crossing vehicle ascends the incline. Then as the vehicle passes the center of the bridge the anchor vehicle is moved onto the bridge to prevent reverse movement of the bridge. This is then repeated from the opposite side in the reverse order. Sand and loose fill make this method necessary.

Even though this bridge is portable and can be dismantled it is heavy and cumbersome to erect, but is far better than the other alternative which at times of high velocity is difficult and often impossible.

The materials were obtained from the salvage pile but due to the high overhead and high cost of foreign supervision the fabrication costs amounted to $112.00. When this figure is compared with the amount needed to properly maintain the former system, which was never done, it would be only a very small percentage.

VEHICLE-WINCH CABLEWAY
and
CARRIAGE FOR MEASURING CANALS

by
I. A. Heckmiller, Hydrologist

The Boghra, Shamalon, Darweshan, South Arghandab and Tarnak canals, in Afghanistan were built with very little consideration being given to the problems a hydrographer would encounter in making discharge measurements of flow for rating purposes. The only structures over or in the canals are siphons, drops and checks, excepting for one road bridge over each of the above canals. Neither the canal structures nor the road bridges are suitable for our purpose and therefore other means of attaining the desired infsrmation must be resorted to.

There are numerous points in the canals where this data must be obtained and installations of permanent cableways of the type written up in a Water Resources Bulletin of several years ago would suffice, but would be too costly. That article covered the use of a carriage supported on a cableway and moved from station to station by means of a tag line from opposite sides of the stream. The sounding reel was anchored on the river bank with the meter suspension cable supported over a pulley on the carriage.

To avoid the costly cableway installation the writer devised the idea of using a vehicle mounted winch cable suspended over the canal and anchored to a second vehicle on the opposite canal bank. In place of a second vehicle a steel shaft driven into the landward side of the canal dike has been used as an anchor.

The carriage is triangular shaped made with two carrier sheave wheels riding on the cableway. The meter suspension cable is supported over two other sheave wheels one located at the bottom of the triangle and the second located at one edge within the upper third of the carriage. This sheave wheel is so placed to prevent tipping of the carriage. The sounding-reel is mounted on the vehicle bumper and after the carriage is brought to the desired station of the cross-section, by means of the tag line, the meter is placed at the water surface with the depth indicator set at zero and the remainder of the procedure is identical to that followed in bridge and cablecar measurements.

This carriage has also made possible the measurement of flow in the Shiela Charhk canal near Kala Kong with the use of the ferry-boat and cable. The Shiela Charhk canal, in the past three years,

has more than .....

has more than doubled in width as well as in the quantity of water it carries. Three years ago it was spanned by a bridge less than one hundred feet in length, from which discharge measurements were made. The canal is now well over two hundred feet wide. After the flood damage of 1938 a ferry-boat attached to a cable replaced the bridge. The cable has considerable sag and is not elevated at the banks. To obtain the desired clearance between the cable and the water surface for the carriage, the cable is supported on the boat anchored in the canal. Since the sounding-reel cable length is insufficient to span the canal the reel is mounted on the boat. As the current meter progresses toward the boat, the boat is reanchored to avoid distorted velocities being observed. This precaution is very essential as the boat is of the viking vintage.

CONCLUSION

The problems discussed above may lead the reader to assume that the writer has wasted five years at this post. On the contrary, it is believed that great stride has been made in this period and will, without doubt, continue. The greatest asset will be when an increasing number of trainees are made available for guided training in this field, preferably those having completed twelfth class or above. The outlook, in the not too distant future, of possibly drawing from qualified graduates of the engineering and agricultural college in Kabul is a most promising one.

There has been progress made in the Helmand Valley Authority, taking over some of their responsibilities in this section, in that, they are now furnishing some vehicles for field work and carry the cost of the maintenance, as well as, provide gasoline for the operation of both Helmand Valley Authority and International Cooperation Administration vehicles used for field work. They pay the salaries for all Afghan employees, including hydrographers, gage readers, watchmen and laborers. Helmand Valley Authority has also absorbed, where possible, the costs of construction in connection with rehabilitation and maintenance of the stations.

The tentative .....

The tentative target date for phasing out this project is 1961. It is difficult to say, at this time, as to whether the organization of Helmand Valley Authority will then be in a position to absorb the full responsibility or not, but since the Chief Engineer of the Helmand Valley Authority engineering department has shown concern in the management of the field and office operations it should be a safe assumption, that with additional qualified personnel, this section will continue to function. The Helmand Valley Authority is fully aware of the importance of the past and current data collected. They will do all that is possible to continue to collect this type of data, even if not to the same degree of accuracy the United States Geological Survey strives to attain.

The writer wishes to take this opportunity to express his appreciation to all who have so willingly cooperated in aiding toward the efforts of this project. To name each and every one would be fitting but too lengthy. Special attention is directed to His Excellency Abdullah Malikyar, Minister of Finance of Afghanistan and General President of Helmand Valley Authority; Dr. Abdul Kayeum, Acting General President of Helmand Valley Authority; Dr. Abdul Wakil, Vice-President of Helmand Valley

Authority Agriculture ....

Authority Agriculture Department; Mir A. Ansary, Administrative Vice-President, Helmand Valley Authority; Sayed Wahdat Shah, Technical Vice-President; Mir Akbar, Chief Engineer; A. Tayab Assifi, General Director, Canal Operation and Maintenance Department; Shah Naebkhal, Director of Planning-Engineering Department; Karl O. Kohler, Chief Adviser to Helmand Valley Authority; and personnel of Morrison-Knudsen-Afghanistan, Incorporated, personnel of the Afghan Construction Unit, and personnel of the United States Operation Mission to Afghanistan for the interest and assistance, shown and given, toward accomplishing the goals of this joint project. Much respect is due my good friend Sadar Mohammed Alam Khan (Mr. 5 x 5), Chief of Chahar Burjak for his everlasting hospitality and welcome extended on each visit to one of the gaging stations near his village, which is in the most remote section of Afghanistan.

****